

XII.—*On the Invertebrate Marine Fauna and Fishes of St. Andrews.* By W. C. M'INTOSH.

[Continued from vol. xiii. p. 432.]

Subkingdom ANNULOSA.

Series I. ANNULOIDA.

Class ECHINODERMATA.

The Echinoderms of St. Andrews, though plentiful, are by no means remarkable, being those generally distributed over the north-east coast. We do not find the rosy feather, the bird's-foot, and the little cushion starfishes so abundant on the southern and western shores, the former extending to the tangles of Shetland and far into the Atlantic. The beautiful pale bluish-purple *Asterias glacialis*, so common under littoral stones at Herm, and the great *Luidia Savignii* of the surrounding currents are absent (though the former occasionally occurs on the east coast of Scotland); and so is *Asterias Mülleri* of the Hebridean lochs. The northern waters are further distinguished by the piper (*Cidaris papillata*) and swarms of *Echinus norvegicus*; and the southern by the splendid condition of the purple, Fleming's, and the silky-spined urchins. The profusion of sea-cucumbers characteristic of certain parts affords another contrast: thus, as truly said by Prof. Edward Forbes, the giant of the race seems to have rallied all his subjects around him in the rich tangle-forests of the Zetlandic voes. The vast numbers of *Synapta tenera* on the muddy banks of the numerous islets in the Sound of Harris is distinctive, just as the abundance of *Synapta Galliennii* (which the Rev. Mr. Norman seems inclined to link on to *S. inherens*) is in Belgrave Bay, Guernsey, and a large brownish-purple species on the south-west coast of Ireland.

The places of the rare are filled by a multitude of the common forms, which abound on the beach after storms, and under stones between tide-marks, or are dredged in the surrounding waters. The ease with which the development of the young of this group can be observed opens up an excellent field for future investigators.

I have to thank the Rev. A. M. Norman for his kind assistance in revising the following list, and determining several Holothuroidea.

## Order II. OPHIUROIDEA.

## Fam. 2. Ophiuridæ.

## Genus 4. OPHIOTHRIX, Müller &amp; Troschel.

*Ophiothrix fragilis*, O. F. Müller; Rev. A. M. Norman, Ann. & Mag. Nat. Hist. February 1865, p. 107.

Abundant under stones in rock-pools and near low-water mark, and dredged in the water beyond to a considerable depth. Many of the stones in the pools are covered with the ova of this species about the middle of November; and some of the starfishes have them attached to the disk.

## Genus 5. AMPHIURA, Forbes.

*Amphiura filiformis*, O. F. Müller; Norman, *op. cit.* p. 107.

Occasionally in the stomachs of haddocks. Rare.

*Amphiura Chiajii*, Forbes; Norman, *op. cit.* p. 107.

Vast numbers are thrown ashore on the West Sands after storms. It is also common in the stomachs of the cod and haddock.

*Amphiura elegans*, Leach; Norman, *op. cit.* p. 109.

Frequent under stones in rock-pools and near low water, especially towards the Rock and Spindle.

## Genus 7. OPHIOCOMA, Agassiz.

*Ophiocoma nigra*, O. F. Müller; Norman, *op. cit.* p. 111.

Not uncommon from deep water (by dredging and the deep-sea lines of the fishermen). It does not occur in profusion, as in many parts of the Zetlandic and southern portions of our seas.

## Genus 8. OPHIOPHOLIS, Müller &amp; Troschel.

*Ophiopholis aculeata*, O. F. Müller; Norman, *op. cit.* p. 112.

Rather plentiful in deep water, and common in the stomach of the cod; occasionally under stones near low water at the East Rocks.

## Genus 9. OPHIURA, Lamarck.

*Ophiura lacertosa*, Pennant; Norman, *op. cit.* p. 112.

Abundant off the West Sands, and thrown on the beach in

great numbers after storms; it is then much preyed on by gulls.

*Ophiura albida*, Forbes; Norman, *op. cit.* p. 113.

Dredged off the East Rocks on a sandy bottom, and procured from the stomachs of haddocks.

### Order III. ASTEROIDEA.

#### Fam. 1. Astropectinidæ.

##### Genus 10. ASTROPECTEN, Linck.

*Astropecten irregularis*, Pennant; Norman, *op. cit.* p. 116.

Very abundant on the West Sands after storms.

##### Genus 11. LUIDIA, Forbes.

*Luidia Sarsii*, Düben & Koren; Norman, *op. cit.* p. 118.

Occasionally from the deep-sea lines of the fishermen. It takes the place of the larger *L. Savignii* of the prolific waters of the Channel Islands.

#### Fam. 2. Solastridæ.

##### Genus 15. SOLASTER, Forbes.

*Solaster papposus*, L.; Norman, *op. cit.* p. 122.

Abundant on the West Sands after storms, and at all times at low water amongst the rocks.

*Solaster endeca*, L.; Norman, *op. cit.* p. 122.

Not uncommon on the West Sands after storms, but much less abundant than the foregoing.

##### Genus 18. CRIBRELLA, Agassiz.

*Cribrella sanguinolenta*, O. F. Müller; Norman, *op. cit.*  
p. 124.

Very common between tide-marks, often hanging to the dripping sides and roofs of caverns. A large and much softer variety occasionally occurs. The greater diameter in several instances reaches 5 inches; and one exceeds this size.

## Fam. 3. Asteriadæ.

## Genus 20. ASTERIAS, L.

*Asterias rubens*, L. ; Norman, *op. cit.* p. 128.

Abundant between tide-marks and beyond. Many singular varieties, from the loss or partial reproduction of the rays, occur. A specimen shows five large rays, two of which are formed by the splitting of one arm, while in the interspace two small rays situated one over the other occur. They spawn in November; and many are found in the peculiar stool-like position, grasping the ova, at this season. The same posture, however, is sometimes assumed when devouring *Littorina obtusata* or other mollusks.

*Asterias violacea*, O. F. Müller; Norman, *op. cit.* p. 128.

As common as the foregoing, and even more so between tide-marks.

*Asterias hispida*, Pennant; Norman, *op. cit.* p. 128.

This species has only been seen at St. Andrews by Prof. Edward Forbes, who found several specimens on the sands after a storm in 1839. Although hundreds of small forms have been examined, no specific character has occurred to separate them from the foregoing (*A. rubens* and *A. violacea*).

## Order IV. ECHINOIDEA.

## Fam. 1. Cidaridæ.

## Genus ECHINUS, L.

*Echinus esculentus*, L. ; Forbes, Brit. Starfishes, p. 149.

Common amongst the tangles at extreme low water, and in the laminarian region beyond; young specimens occur under stones between tide-marks. In many the intestinal canal is loaded with fragments of laminarian stalks, pieces of *Delesseria*, and other seaweeds covered with *Membranipora*; in some there are fragments of the shells of *Balanus* and tubes of *Serpula*.

*Echinus miliaris*, Leske; Forbes, Brit. Starf. p. 161.

Not uncommon under stones in rock-pools.

*Echinus Flemingii*, Ball; Forbes, Brit. Starf. p. 164.

Occasionally in deep water off the bay, and thrown on the West Sands after storms. The specimens are much less than those of the Channel Islands.

Genus TOXOPNEUSTES, Agassiz.

*Toxopneustes dröbachiensis*, O. F. Müller; Forbes, Brit. Starf. p. 172 (as *Echinus neglectus*).

Not uncommon on the West Sands after storms. The specimens are smaller than those from the Channel Islands.

### Fam. 2. Clypeastridæ.

Genus ECHINOCYAMUS, Leske.

*Echinocyamus angulosus*, Leske; Forbes, Brit. Starf. p. 175.

Abundant in deep water and in the stomachs of the cod, flounder, and haddock. Worn specimens also occur at the East Rocks amongst the shell-gravel.

### Fam. 3. Spatangidæ.

Genus SPATANGUS, Klein.

*Spatangus purpureus*, O. F. Müller; Forbes, Brit. Starf. p. 182.

Not uncommon in deep water, and occasionally thrown on the West Sands by storms.

Genus ECHINOCARDIUM, Gray.

*Echinocardium cordatum*, Pennant; Forbes, Brit. Starf. p. 190.

Very common off the West Sands, and tossed on the beach at all seasons.

*Echinocardium ovatum*, Leske; Forbes, Brit. Starf. p. 194 (as *Amphidetus roseus*).

Occurs in deep water, and on the beach after storms; somewhat rare.

## Order V. HOLOTHUROIDEA.

## Fam. Psolidæ.

## Genus PSOLUS, Oken.

*Psolus phantapus*, L. ; Forbes, Brit. Starf. p. 203.

Occasionally from deep water, and brought in by the fishing-boats.

## Fam. Pentactæ.

## Genus CUCUMARIA, Blainville.

*Cucumaria* — ?

A large purplish-brown species, common on the West Sands after storms. Mr. Norman thinks "this is probably the species found by Mr. Goodsir off the Fifeshire coast, and referred to *C. frondosa* by E. Forbes. It is very like that species in most of its characters, especially in the total absence of skin-spicules, and in the form of the tentacular spicula, which are elongated and cribose. It appears to differ from *C. frondosa* in its very thick test, and especially in appearing to have feet scattered over the body between the regular rows. At the same time it is possible that the firmness may be due to a state of rigid contraction from having been beaten about in a storm when alive; and with respect to the latter, the pores may not mark contracted feet. . . . It does not correspond badly with the description of *C. Drummondii*, a species unknown to me."

*Cucumaria elongata*, Düben & Koren; Norman, Zetlandic Fauna, Rep. Brit. Assoc. 1868, p. 316.

= *Cucumaria pentactes*, Forbes (partim), the centre figure in woodcut, p. 213.

Specimens are occasionally brought from the coralline ground by the fishermen.

*Cucumaria Hyndmanni*, Thompson; Forbes, Brit. Starf. p. 225.

Not uncommon in the stomachs of haddocks and cod.

*Cucumaria lactea*, Forbes & Goodsir; Forbes, Brit. Starf. p. 231.

Abundant in the coralline region amongst zoophytes. Young specimens are numerous in June.

## Genus THYONE, Oken.

*Thyone fusus*, O. F. Müller; Forbes, Brit. Starf. p. 233.  
Common in the stomachs of cod and haddock.

## Genus THYONIDIUM, Düb. &amp; Koren.

*Thyonidium Dubeni*, Norman, *op. cit.* p. 317.

Occasionally in the stomachs of the cod and haddock. Mr. Norman states that he has found it on the coast of Ireland, as well as in Shetland. He observes (*in lit.*) that in this form there are no skin-spicula; feet with a large, circular, cribose plate at the end, no spicula on sides; tentacles cased in large cribose spicula of varied form—elongated, short, or most elegantly irregular and branched.

*Thyonidium commune*, Forbes & Goodsir; Forbes, Brit. Starf. p. 217, and Norman, *op. cit.* p. 317.

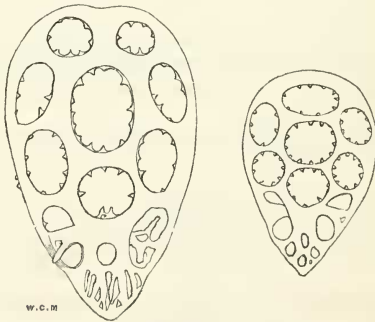
A fragmentary specimen in the stomach of a cod.

## Fam. Synaptidæ.

## Genus SYNAPTA, Eschsch.

*Synapta inhaerens*, O. F. Müller; Dr. Herapath, Journ. Micr. Sc. 1865, p. 4.

The typical form occurs between tide-marks, as well as in the laminarian region, the anchor-plates having six apertures



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surrounding the central, and comparatively few openings in the narrow part to which the anchor is attached (see smaller

figure in woodcut, which represents both forms  $\times 210$  diam.). Such agrees closely with examples from the Channel Islands, the Hebrides, and other parts. An imperfect specimen from the stomach of a haddock diverges very considerably in the form of its anchor-plates (woodcut, larger figure), since the whole plate is much larger, and there are generally seven apertures round the central, instead of six as in the former case; while the slits in the smaller end (to which the anchor is attached) are much more numerous and linear. Various abnormal anchors occur in *S. inhærens*, such as one with five flukes (a bifid process on the summit, a bifid fluke and a normal serrated fluke), or an anchor with several processes on the stalk.

[To be continued.]

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#### BIBLIOGRAPHICAL NOTICE.

*A History of British Quadrupeds, including the Cetacea.* By THOMAS BELL, F.R.S., F.L.S., F.Z.S., F.G.S., &c. Second Edition, revised and partly rewritten by the Author, assisted by ROBERT F. TOMES, Corr. Memb. Z.S., and EDWARD RICHARD ALSTON, F.Z.S. London: Van Voorst, 1874.

THIS long-expected volume, which enterprise, science, and art have alike combined to render attractive, has at last issued from the press; and we heartily welcome its appearance. Of the beautiful series of works on British zoology which bear on their titlepages the name of its spirited publisher, few are likely to become so popular. Less bulky than its predecessor of five-and-thirty years ago, it possesses yet stronger claims to our admiration: the species and numerous varieties of our domestic animals have been wisely eliminated, and none but *feræ nature* of the British Islands now find a place within its pages.

From our previous acquaintance with the productions of the accomplished author, no less than from the qualifications of those who have rendered him assistance on the present occasion, we were, of course, prepared to meet with much that would be appreciated by the scientific, and that would prove interesting to the general reader: nor have we been disappointed. For many years it has been no secret that the delay in the appearance of this edition could not justly be attributed either to the author or his publisher. His change of residence from London, "the centre of literary and scientific society and information," to the classic and appropriate home of Selborne (the Mecca of field-naturalists), and other circumstances over which he had no control, induced him to call in the aid of two gentlemen, which is duly acknowledged on the titlepage, each of them fully qualified to impart the most recent information in the particular department to which his attention had been especially directed; but, as we are told in the Preface, "the dilatory manner